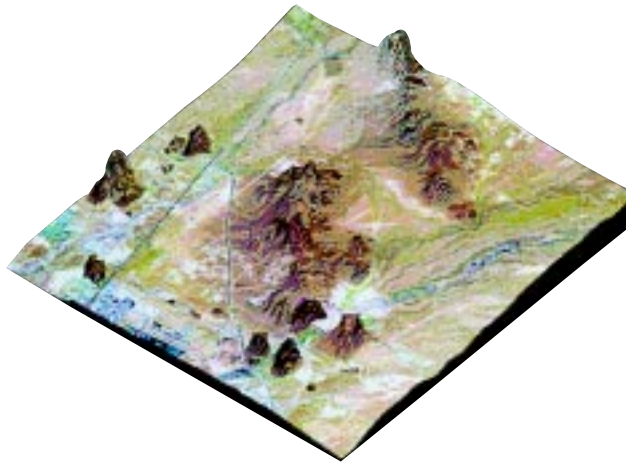


Chapter 2



If we are to
create a sustainable world—
one in which we are accountable to the needs
of all future generations and all living
creatures—we must recognize that our present
forms of agriculture, architecture, engineering,
and technology are deeply flawed. To create
a sustainable world, we must transform these
practices. We must infuse the design of
products, buildings, and landscapes
with a rich and detailed
understanding of ecology.

Sim Van der Ryn and
Stuart Cowan, 1996

Sonoran Preserve Planning and Analysis

Since 1985, research and planning projects have been conducted in the north Phoenix area. This chapter offers a brief synopsis of the specific studies relevant to preservation. Discussion of these projects is included to illustrate the depth, intensity, and evolution of the Sonoran Preserve planning process. Results from the ecological studies have been used to help select land for inclusion in the preserve. Previous planning efforts have also contributed by building a framework for developing the master plan components.

A. General Plan for Peripheral Areas C and D

In 1985 four peripheral areas were identified for special study in the Phoenix General Plan. Two of these areas, designated as Areas C and D, constitute the 110-square-mile annexed region of north Phoenix delineated by the Carefree Highway to the north, Scottsdale Road to the east, the CAP canal and Jomax Road to the south, and 67th Avenue to the west. A general plan was developed for the area in 1987. The open space and trails plan generally designates mountains and the 100-year flood zone as areas recommended for use as public open space. Significant components of open space were identified in the plan including mountains, regional stormwater retention sites, major washes, desert land, and archaeological sites (Figure 2.1).

The total open space areas represented approximately 17,500 acres, or 25 percent of the total land area (Planning Department 1987). The mountains were discussed for incorporation into the Mountain Preserve System. Major washes were identified as an environmentally fragile resource appropriate for open space, but when the plan was adopted including these and other nonmountainous areas was generally not considered. Instead, washes and low-lying desert lands with high visual quality were recommended for low-density development rather than incorporation into a preserve system. Washes were considered primarily for drainage and for use within a larger trail system (Planning Department 1987). However, this plan was completed before ecological inventories and analyses were conducted, so it did not accommodate for preserving a diversity of land types.

B. South Mountain Master Plan

In 1989 the *South Mountain Park Master Plan* was prepared by P&D Technologies for the PRLD. Three primary initiatives were identified to secure South Mountain Park as a recreational

and natural resource by developing strong programs in restoration, management, and environmental ethics (PRLD 1989). A 15-year phasing plan was developed as part of this plan. The plan includes restoration of all Civilian Conservation Corps structures, recognizing that they contribute to the unique character of the park as well as offer an opportunity for interpretation. In addition to restoring historic structures, revegetation of damaged lands within the park is emphasized over investment in new facilities. The plan also established a hierarchy for trailheads and a trail system that adds 37 miles of multi-use trails to the 22 miles of existing trails. Priority is placed on rehabilitating the existing trails prior to new trail construction. To date, much of the rehabilitation has been completed and a new environmental education center is open.

C. Desert Preserve Preliminary Plan

In 1993 the City Council approved a new policy establishing a desert preserve for the northern growth areas of the city. This policy recommended that a system of environmentally sound open space lands be preserved that would include all indigenous plant communities and habitat types. This concept was refined and developed with citizen participation through the established boards and commissions, as well as committees established to develop policies on specific issues. The Desert Preserve Citizen Advisory Committee, appointed by the Parks and Recreation Board, was charged with preparing a report defining which lands were to be included in the desert preserve system. The committee submitted a preliminary plan recommending 11,000 acres of primary and secondary washes, scenic corridors, and utility corridors for the program (Figure 2.2). The committee did not address mountains and foothills. These areas were considered the charge of the Mountain Preserve Citizens Advisory Committee. The *Desert Preserve Preliminary Plan* was approved by the Parks and Recreation Board and City Council in 1994 (PRLD 1994). The Parks and Recreation Board designated this new preserve initiative as the Phoenix Sonoran Preserve System.

The plan was based on initial environmental inventories and analysis. The PRLD used United States Geological Survey (USGS) 7.5 minute maps for a base sheet. Maps were prepared to show slope characteristics at five percent slope intervals, proposed streets, the general plan for the area, planned trails and bikeway systems, natural systems and features, and



Figure 2.1 General Plan Peripheral Areas C and D, 1989

Previous planning efforts have also contributed by building a framework for developing the master plan components.

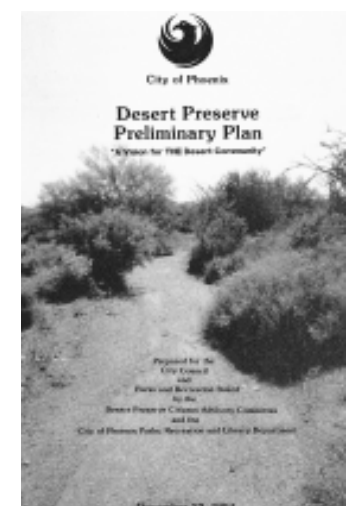


Figure 2.2 Desert Preserve Preliminary Plan, 1994

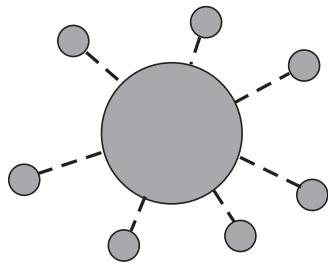


Figure 2.3 Concentrated concept

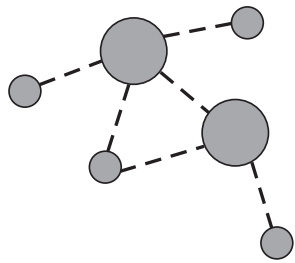


Figure 2.4 Semiconcentrated concept

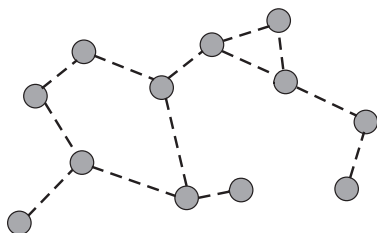


Figure 2.5 Dispersed concept

potential archaeological sites. Seven categories of desert lands are identified in the preliminary plan: major washes and floodplains, secondary washes, utility corridors, view corridors, mountains, open space linkages, and scenic corridors.

The goals developed in the *Desert Preserve Preliminary Plan* have been adopted as resolutions into the recreation element of the *General Plan for Phoenix 1985–2000* (Planning Department 1994). These goals provide the philosophical foundation of the *Sonoran Preserve Master Plan*. These goals are to:

- Connect significant public open spaces, utility corridors, canals, freeways, and recreation areas already owned or proposed by city, county, state, or federal agencies
- Preserve wildlife corridors and significant desert ecosystems along drainageways by preserving the natural desert wash characteristics such as low velocity, sedimentation, and dispersed flows
- Provide passive recreational opportunities for wildlife viewing, nature study, picnicking, outdoor interpretation, and education
- Provide alternative transportation corridors for walking, commuter and recreational bicycling, and horseback riding
- Preserve significant views, cultural resources, and visual landmarks such as large tree bosques, rock outcroppings, historic features, and archaeological sites
- Establish management, maintenance, acquisition, and funding guidelines that respond directly to these increased open space standards and encourage public/private partnerships
- Encourage, to the greatest extent possible, the inclusion of land and specific sites that allow access for people of all abilities to appreciate and enjoy the Sonoran Desert

The work done as part of this plan represents a significant departure from previous planning efforts that considered the natural environment but focused preserve efforts on visually prominent lands that were less suitable for development. The goals listed above demonstrate a desire to balance aesthetic, social, economic, and ecological concerns.

D. North Study Area Concepts and Public Review Process

In 1996 the PRLD developed three concepts for the Phoenix Sonoran Preserve to illustrate several ways that the approximately 12,000 potential preserve acres in the NSA could be configured. Since the planning at this point was conceptual, a precise acreage was not designated. The three concepts demonstrate a range of approaches to open space acquisition and built onto open space lands already owned or controlled by the PRLD.

All three concepts identified major and secondary access points with the appropriate level of development recommended for each. Development included ramadas, drinking fountains, parking lots, trailheads with signs, interpretive signage, and environmental education facilities. There were three major access points identified—off Jomax Road in the Cave Buttes Recreation Area; at the base of the Union Hills and intersecting the Apache Wash; and west of I-17 north of the Deem Hills. These would provide regional access, have the focus of recreational activities such as picnicking, and include interpretive centers. There were eight secondary access points positioned around the preserve to allow for local parking and trailhead access. Through the development review process, provision is expected for neighborhood access points at quarter-mile intervals along the preserve perimeter to ensure easy access for pedestrians and bicycles. The three concepts that went through the public review process were general configurations of possible preserve forms.

Concentrated

The concentrated concept contains the preserve in one large contiguous parcel that maximizes habitat and wildlife benefits (low perimeter/area ratio). This idea is most analogous to South Mountain Park, and the area would function as a regional park. This concept lessens the emphasis on the recreational access and creates the greatest opportunity for isolated natural areas. Preserve visitors may have to travel longer distance to get to the preserve (Figure 2.3).

Semiconcentrated

The semiconcentrated concept holds a middle ground between the other two concepts. It has significant areas set aside for conservation while allowing for reasonable recreational access from adjacent developments. All habitat/vegetation types are included (moderate perimeter/area ratio) (Figure 2.4).

Dispersed

The dispersed concept integrates the preserve into developed areas, allowing a great number of users access from home and work. This could be called a “backyard approach,” creating a greater potential for negative impact on wildlife and habitat (highest perimeter/area ratio) while increasing neighborhood pedestrian and bicycle access (Figure 2.5).

In November and December 1996, the three concept plans for the Sonoran Preserve were presented to the Parks and Recreation Board, nine village planning committees, and the Environmental Quality Commission. A presentation for the Planning Commission was held on January 8, 1997.

In early December 1996, the PRLD held a coordinating meeting with representatives from the adjacent Cities of Peoria and Scottsdale, Maricopa Association of Governments, Arizona State Land Department, Arizona Game and Fish, U.S. Forest Service, U.S. Bureau of Land Management, Flood Control District of Maricopa County, and other municipal parks and recreation departments. The intent of the meeting was to provide an exchange of information about the Phoenix plans and to foster long-term cooperation and coordination with other local open space efforts.

Open lines of communication have been maintained with these organizations as well as with the Towns of Cave Creek and Carefree, Arizona Department of Agriculture Plant Services Division, U.S. Department of the Interior Fish and Wildlife Service, and Desert Foothills Land Trust. In May and June 1997, the PRLD continued information exchange efforts with the neighboring cities and organizations. Maintaining open communication is an ongoing activity.

The three concepts were presented at two open houses hosted by the PRLD on December 3 and 11, 1996. Notices were mailed to a list of interested citizens, including organizational contacts for the Mountain Preservation Council, the Mountaineers, the Sierra Club, the Audubon Society, the Central Arizona Homebuilders Association, the Realtors Association, and the Valley Partnership. Although attendance was light, the 99 questionnaires received have been very useful. Those in attendance were enthusiastically supportive.

Respondents ranked the three concepts in order of preference from most to least preferred. The concentrated concept was selected as the most preferred by 61 percent of the respondents, followed by the semi-concentrated concept, selected by 32 percent of the respondents as being most preferred. Only five percent of the respondents most preferred the dispersed concept (Table 2.1). Many of the respondents articulated that preserving the health of the environment should be of the utmost importance.

Master Plan Concepts

	1	2	3	No Response
Concentrated	61%	18%	5%	15%
Semiconcentrated	32%	46%	1%	20%
Dispersed	5%	4%	60%	30%

Ranked in order of preference with #1 being most preferred and #3 being least preferred.

Table 2.1 Master plan concepts

E. Desert Spaces Plan

In 1995 the Maricopa Association of Governments (MAG) Regional Council adopted the *Desert Spaces* plan for the 9,200- square-mile region of Maricopa County (Figure 2.6). In 1996 the Phoenix City Council adopted the plan. The concept of the plan was to preserve, protect, and enhance the mountains and foothills, rivers and washes, canals and cultural sites, upland vegetation, wildlife habitat, and existing parks and preserves. The intent of this plan was to provide a nonregulatory framework directed toward establishing a regional open space network (MAG 1995). The plan defines regionally significant mountains, rivers, washes, and upland desert. The scale of this effort was not specific to Phoenix, but the plan does identify regionally significant open spaces within the city limits.

Lands identified within the developed portions of the city include the Agua Fria and Salt Rivers and the canal system. While these lands play an important role in creating an interconnected network of open space, they are almost entirely disturbed lands and not the focus of this planning effort. However, the PRLD is involved in multiple projects relating to lands associated with the rivers and the canals, including habitat restoration along the Salt River, the Tres Rios project, and several demonstration projects along the canals.

The *Desert Spaces* plan identifies the following NSA lands for conservation, and describes them as having outstanding open space value: Union Hills, Deem Hills, Pyramid Peak, Middle Mountain, Ludden Mountain, Hedgepeth Hills, Skunk Creek, and Cave Creek Wash. The majority of undeveloped lands, primarily north of Happy Valley Road, not recommended for conservation in the NSA are identified for retention. Retention is defined as lands with high open space value. Several areas adjacent to South Mountain are identified for conservation and retention, the largest area being the undeveloped lands south of the park boundary and north-east of the Gila River Indian Reservation.

Specific policy recommendations were made for protection of mountains, rivers and washes, upland Sonoran Desert, historic and archaeological sites, canals and trails, and community buffer zones. The *Desert Spaces* plan was considered in developing the Sonoran Preserve and is a valuable tool for continuing the PRLD’s commitment to cooperation and coordination with other local open space efforts. Several of the policy recommendations that have a direct relation to the Sonoran Preserve are listed below.

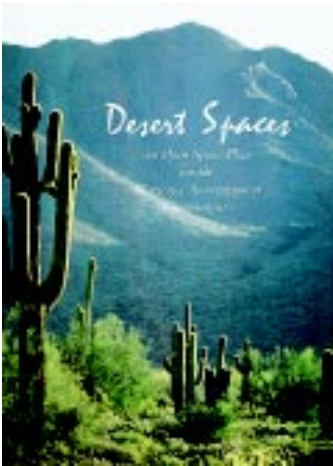


Figure 2.6 Desert Spaces, 1995, prepared by DesignWorkshop, Inc.

The intent of the meeting was to provide an exchange of information and to foster long-term cooperation and coordination with other local open space efforts.

Basing preservation
boundaries on ecosystems
rather than topography or land
ownership is new to Phoenix.

Discourage Development within the 100-Year Floodplain

This effort will minimize the negative impacts on fragile xeric-riparian habitats and maximize the protection of diverse natural vegetation associated with washes.

Protect Upland Sonoran Desert Vegetation

Areas not protected as open space should be developed sensitively. For example, mass grading should be discouraged and the use of native plant materials should be required.

Protect Ridge Lines as well as Terrain and Foothills

This effort will protect the pristine character of our region as well as provide buffers for preserved open space, mountain preserves, and wildlife areas.

In considering landforms, open space was recommended for conservation above the 12 percent slope. It is important to note when considering landforms in the entire county, significant topographic features exist. For example, the White Tank Mountains rise above the valley floor in excess of 2,800 feet. South Mountain rises over 1,500 feet above the valley floor. However, caution should be used when considering slope as a limiting factor. Using a standard slope to determine development limits does not guarantee that enough of a hill or a mountain will be preserved as significant open space. Slopes in the NSA are relatively gentle in comparison to all landforms in Maricopa County. The greatest elevation change in the NSA is at Pyramid Peak. From valley floor to the highest point is less than 700 feet. Since *Desert Spaces's* 12 percent slope recommendation took into account landforms throughout the county, then slope restrictions in the NSA should exceed MAG's countywide recommendations to adequately preserve the area's mountains, hills, and peaks.

F. North Phoenix Wash Preservation Boundary Studies

In 1996 the City of Phoenix commissioned ASU's School of Planning and Landscape Architecture (SPLA) and ASU West's Life Sciences Program to study Cave Creek Wash, a major drainage identified in the *Desert Preserve Preliminary Plan* and the *Desert Spaces* plan. A team of ecologists, landscape architects, and planners worked together to evaluate the plant communities within and along the wash corridor (Figure 2.7). Based on field samples of the vegetation, the team classified four plant communities and developed preservation boundary recommendations that included a mosaic of the vegetation types. Basing preservation boundaries on ecosystems rather than topography or land ownership is new to Phoenix. In the past, boundaries did not reflect the ecological systems inherent



Figure 2.7 Faculty and students from the ASU School of Planning and Landscape Architecture survey vegetation along Skunk Creek

in the landscape and so the impact of preserve size, shape, and constitution on plant and wildlife habitats were not considered nor well understood. The *Cave Creek Wash Preservation Boundary Study* was presented to the City Council and the Parks and Recreation Board in fall 1996 (Ewan et al. 1996).

In 1997, the SPLA continued the study. This phase includes Apache Wash, Skunk Creek Wash and its tributaries, and Deadman Wash. This study was completed in November 1998 and complements the Cave Creek Wash report. Within both reports, the following recommendations were made and were considered in developing the Sonoran Preserve plan (Ewan et al. 1996; Ewan and Fish Ewan 1998):

1. *Preserve as large an area as possible*
With the preservation of land and habitat, the diversity and population of species increase while the chances of their being decimated by natural or human forces decreases.
2. *Minimize isolation and fragmentation of habitats*
The greater the habitat fragmentation and isolation from nearby natural areas, the fewer species will be sustained within the preserve; therefore, minimizing isolation will help maximize species diversity.
3. *Minimize contact with adjacent developed areas*
Irregularly shaped preserve boundaries increase native species contact with developed areas, which can lead to habitat isolation, fragmentation, and species decline.
4. *Maintain a diversity of animal habitats and species*
Since different animal species require different habitats and some animals require several plant communities to survive, preserving plant community diversity can maximize animal habitat and species diversity.
5. *Preserve areas representing mosaics of vegetation types*
Preserving mosaics of vegetation types will help maintain animal species diversity, since many animals require different vegetation types to survive. The degraded burn site in the Skunk Creek study area may be an exception.

6. Maintain the cliff areas

The cliffs along the washes provide habitat for a variety of cavity-nesting animals. These areas allow animals to remain undisturbed (Figure 2.8).



Figure 2.8 Cliffs along Cave Creek Wash

7. Maintain stock tanks and surrounding vegetation

Although the tanks are a cultural artifact and not purely natural, they function as semiperennial wetlands. Great blue heron have been observed at tanks in the north Phoenix area. The tanks maintain thick bosques of mesquite and stands of blue paloverde that provide bird nesting sites and shade. They could also be used as interpretive elements for teaching about previous land uses, particularly cattle grazing (Figure 2.9).



Figure 2.9 Skunk Creek Tank

8. Preserve beyond the 100-year flood zone

The Federal Emergency Management Agency-defined 100-year flood zone does not include all vegetation types; therefore, to maximize species diversity, preservation boundaries must go beyond the 100-year flood zone. This would also guarantee all wash edge vegetation would be preserved. Wash edges contain dense populations of large trees that serve as prime habitat.

9. Prohibit grazing within the preserve

Livestock grazing has changed the vegetation composition in the area. Native species, such as tobosa, may reestablish if grazing is discontinued.

10. Maintain the integrity of the watershed

The quality of the entire watershed can affect flora and fauna within the preserve; therefore, maximizing preservation of the watershed will lessen the impacts of off-site pollutants flowing into the preserve (Figure 2.10).



Figure 2.10 The effects of grazing

G. Geographic Information Systems and Computer Modeling

The NSA presents a challenge because of its scale and the large amounts of graphic and descriptive information that have been assembled. At 110 square miles, the NSA approaches the size of Tucson, Portland, or Albuquerque. Computer applications are becoming prevalent and necessary in planning for such large sites. Since July 1996 the PRLD has been working with ASU on the Multidisciplinary Initiative in developing a Geographic Information System (GIS) database and a modeling program for the NSA (Brady et al. 1998).

The first step of this process was to develop a database. The geographic database is substantially complete. Information necessary for park and preserve planning was identified and then developed into a GIS format. The completed themes of information include:

- Aerial map (2.11)
- Hillshade analysis (2.12)
- Aspect model (2.13)
- Geology (2.14)
- Slope analysis (2.15)
- Soil associations (2.16)
- Utility corridors
- Village boundaries
- Existing utilities
- Digital terrain model
- Elevation
- Vegetation
- Visual quality
- Floodway boundaries
- General plan
- Existing land use
- Archaeological sites
- LANDSAT imagery
- Washes
- Ownership

The quality of the entire watershed can affect flora and fauna within the preserve. Maximizing preservation of the watershed will lessen the impacts of off-site pollutants flowing into the preserve.

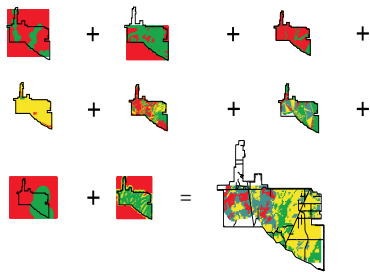


Figure 2.17 Suitability model

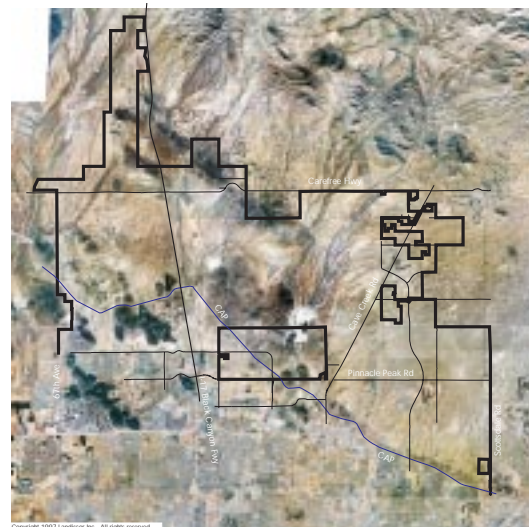


Figure 2.11 Aerial map of North Study Area

The GIS database integrates both graphic and descriptive information and is a valuable tool that can be updated as new data becomes available.

A suitability model was developed by the SPLA, the Environmental Resources program within the SPLA, the City of Phoenix GIS lab within the Information Technology Department, and the PRLD (Figures 2.17, 2.18). Criteria for the suitability model were developed by the PRLD. The model will help inform more subjective preserve planning methods and will also provide a rich bank of ecological data in a GIS environment, which will be useful in the design development phase of the preserve. The criteria were based on analyses of natural factors, goals developed in the *Desert Preserve Preliminary Plan*, and input received from the PRLD outreach efforts.

H. Visual Analysis

A visual analysis was compiled for the NSA using the BLM Visual Resource Management (VRM) system. The BLMVRM system is an analytic process that quasi-objectively identifies visual qualities that should be maintained. The visual analysis ranks areas based on three principles: 1) landscape character is determined by four visual elements—form, line, color, and texture; 2) the greater the influence or impact of these elements the greater the visual interest; and 3) the greater the visual interest in the landscape the more aesthetically pleasing the landscape (PRLD 1995).

The Parks Development Division of the PRLD prepared the inventory and analysis of the area. Landscape architects were assigned sections of the study area and spent several days in

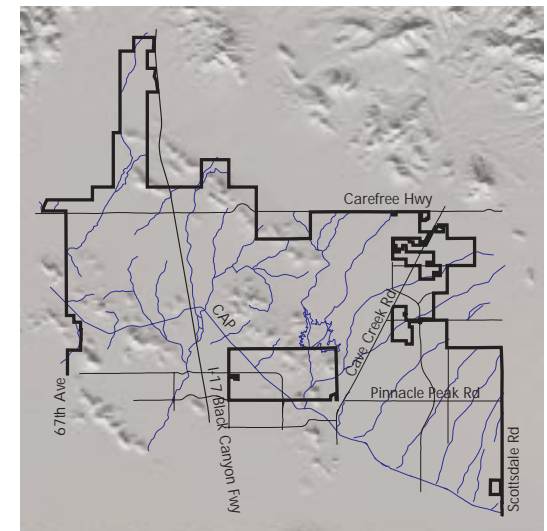


Figure 2.12 Hillshade analysis

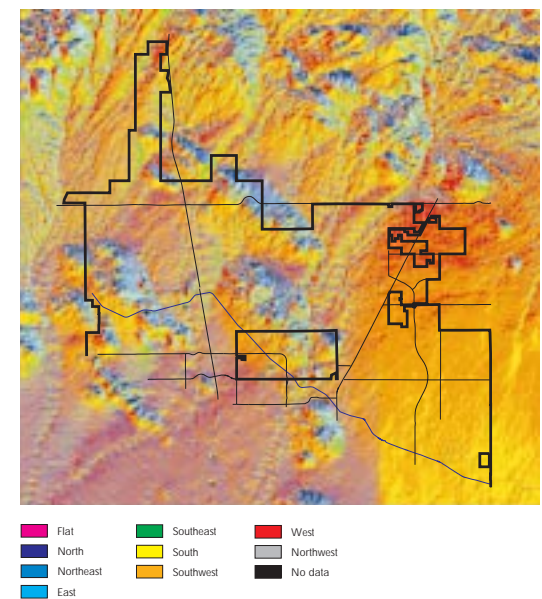


Figure 2.13 Aspect model

the field driving the few dirt roads, photographing the area, and noting significant features. The area was also toured on several occasions by the Phoenix Sonoran Preserve Committee and their planning subcommittee. These visits and those conducted by the PRLD, the Arizona State Land Department, and the primary landowner in the area, provided a thorough inventory of the visually significant features in the study area. These findings were documented and were incorporated into a suitability model.

I. Wildlife Study

The ASU SPLA Environmental Resources program is conducting a wildlife study for the NSA. The study is funded for the first year of a three-year period and includes an inventory

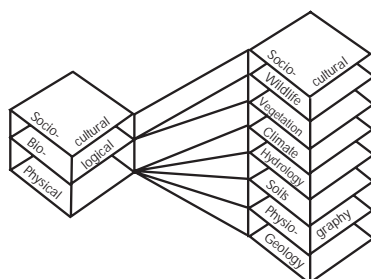


Figure 2.18 Layer cake model
Adapted from Steiner 1991.

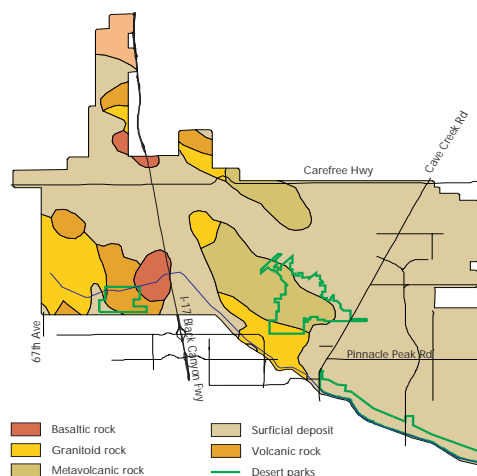


Figure 2.14 Geology
From Brady et al.'s 1998 interpretation of ALRIS data.

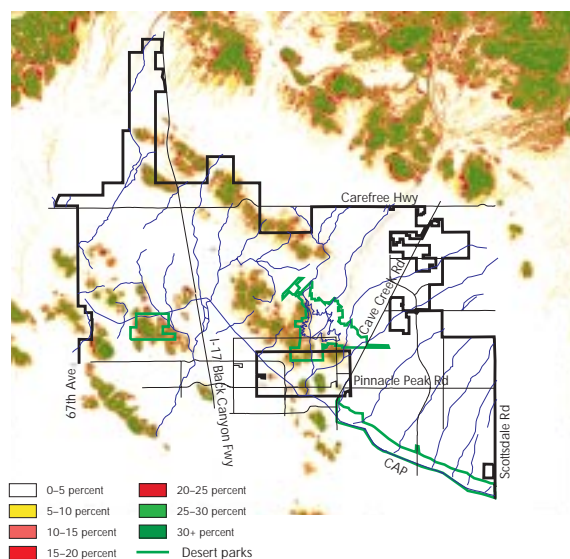


Figure 2.15 Slope analysis

of small and large terrestrial mammals, bats, and avian species (Figure 2.19). The first phase of the study that began in October 1997 is focused on Cave Creek Wash and Skunk Creek Wash. The second and third years of the study will consider secondary washes as well as other physiographic features (e.g., hillsides and creosote bush–bursage flats). The final report will include information on species composition, abundance, richness, and diversity. The data will help inform the continuing refinement of the preserve plan as well as provide baseline data for future evaluation of the ecological health of the preserve.

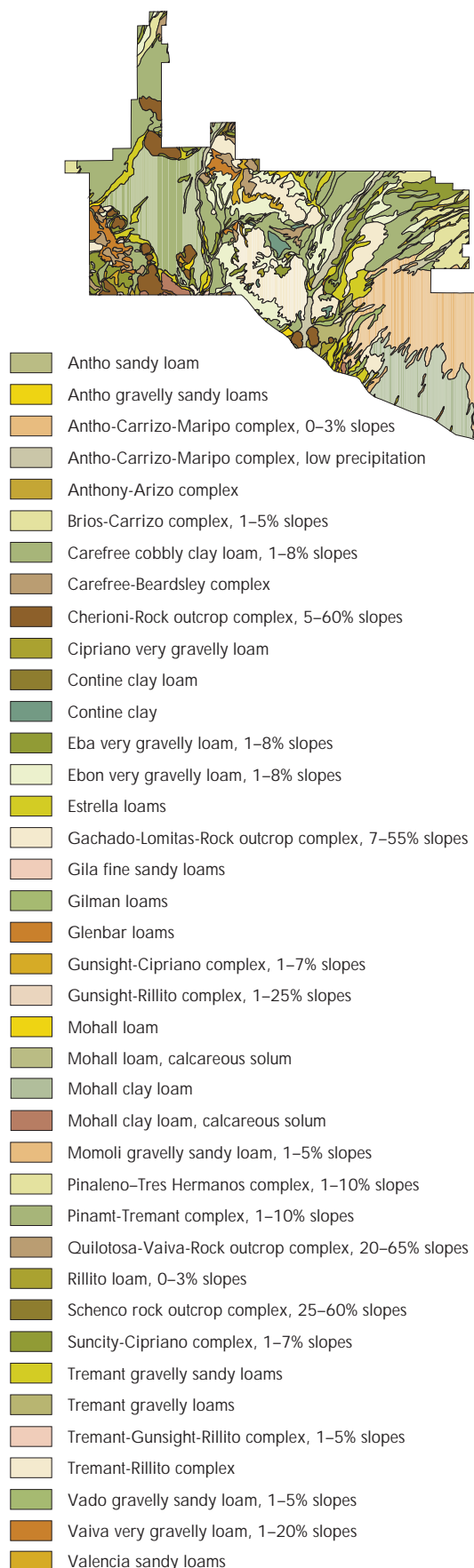


Figure 2.16 Soil associations
Adapted from Brady et al.'s 1998 interpretation of ALRIS data.



Figure 2.19 Kangaroo rat